Initial Assessment for Spring 2007 Pulse Flow Implementation

Potential Associated Costs and Good Neighbor Impacts

Jeff Runge
U.S. Fish and Wildlife Service
November 29, 2006

Document Appendices

Appendix A

Pulse Flow Planning Meeting (July 13, 2006 Final Notes)
June 6, 2006
11:00 CST
NPPD North Platte Hydro Facility

Agenda Topics Discussed at the Meeting

- Discuss Service's approach for evaluating pulse flow alternatives
  - Provide overview of planning document format
  - Discuss associated costs, qualitatively identify associated cost offsets

- Discuss pulse flow implementation alternatives for WY 2007

- Provide updates to flow monitoring plan
  - Discuss USBR unsteady flow model
  - Re-define objectives for 2007 pulse

- Provide habitat updates to habitat monitoring plan
  - Re-define objectives for 2007 pulse

Discuss Service's Approach For Evaluating Pulse Flow Alternatives (Pulse Flow Planning Document, May 30, 2006)

A) EA Water Optimization

There were several concerns/opinions on the timing of a pulse flow release.

- The Service identified that a peak flow in the May/June time period (Option 1) would be reflective of historic peaks, but implementation would be difficult with the current stream flow losses in that period.
- Kinzel identified that an Option 2 pulse release (February/March/April release) may cause pre-pulse field-survey safety issues as a result of potentially cold and icy conditions in this time frame, of which February releases was of the greatest concern. The concern diminishes for March and April releases.
- Anderson provided bar graphs to the group showing gains and losses using data from the Overton, Kearney, and Grand Island stream gages. The gains/losses were separated by flow exceedence intervals. Based on anticipated hydrologic conditions for 2007, Option 2 would likely result in the lowest stream flow losses from Overton to Grand Island.
- Kwapnioski identified Option 3 (August/September) as a potential option for 2007. Although losses from Overton to Grand Island could be relatively high compared to other options due to time of year, losses are anticipated to be less important as a result of surface water irrigation in the system. It is likely that water would be present in the North Platte/Platte Rivers down to Cozad (point of last diversion).

Appendix A

Option 2 vs. Option 3 represent different strategies for generating pulse flows; the former would be a more planned and controlled event, the latter would involve rapid response to an opportune rain event. The timing of both options would have different effects for vegetation removal and control in which Option 3 would occur during seedling development. With the current stream flow losses and with the reduced channel capacity along the North Platte chokepoint, the likelihood of a pulse event achieving the 5,000 to 8,000 cfs peak flow target at Overton would be greater for Option 3. The group largely supported Option 2 because of the uncertainty associated with Option 3. However, the group recognized the potential value of being prepared to implement and monitor an Option 3 pulse in 2007.

B) Associated Costs

Associated costs, as defined by the GC, are financial impacts incurred by the Districts as a result of releasing/conveying EA water in a manner that is not typical of normal operating conditions. One of the agenda topics was to determine if the Service has accurately described all of the known potential Associated Costs as well as any offsets that should be addressed prior to pulse implementation. Because of the limited time to thoroughly discuss all agenda topics, Associated Cost offsets were not discussed in great detail.

It was identified that an additional pulse flow consideration is any impacts to non-District infrastructures. According to the Program's Good Neighbor Policy these impacts should be avoided. Since these impacts are not Associated Costs, this would be categorized as a separate pulse implementation consideration.

Potential Good Neighbor Impacts were identified by the group. There are eleven diversions and four sand dams in the North Platte and Platte Rivers that may be affected by releases. A subset of these diversions is managed by NPPD, and potential damages would be addressed under a Program in accordance to Program Document, Attachment 5, Section 1 (Program Water Management Process – Dated 12/07/2005). The remaining diversions are privately managed and would be addressed separately from Associated Costs. Examples of Good Neighbor Impacts include the North Platte and Keith-Lincoln canal systems that routinely had problems with their diversion dams. There is also a KOA camp ground near Gothenburg that is routinely impacted by high water. Current Nebraska Department of Road construction projects at bridge sites along the river may also be affected by pulse flows.

The group determined that a good outreach plan was essential to minimize potential impacts resulting from pulse implementation. An advance outreach plan would allow time for landowners to prepare for increased flows. A list of diverters can be developed to provide advance notification of a pulse release. It was also suggested by group members to identify any impacts resulting from the July 6, 2002, rainfall event near Ogallala which have affected diversions structures along the Platte River system similarly.

Appendix A

C) Flow and Habitat Monitoring Objectives Achieved

The group was tasked to identify achievable flow and habitat objectives for a 2007 pulse release. In regards to flow monitoring and water accounting, DNR has the capabilities to calculate borrow/payback for the North Platte system, and a similar system can be in place for reservoir re-regulation. Since the majority of stream gages are currently in place, there are few financial needs for adequate flow monitoring. Flow monitoring discussions are explained in greater detail in the flow monitoring update section below.

Little progress was made in identifying which habitat monitoring objectives should be achieved for the 2007 planned pulse. The group agreed that a minimum level of habitat monitoring should be in place at all times to record data for planned pulse flows or peak flows. Insufficient funds may limit the Service from conducting an extensive monitoring program. Kinzel identified that funding for monitoring river morphology at the Uridil site will end in 2007. In addition, the ability of the Program to mobilize an extensive monitoring plan may be difficult in the early stages of its development even though funding may be available. It was stated at the meeting that Platte River EIS money may be transferred to the USBR office in Mills, WY. These sources could provide funding sources for monitoring. Habitat monitoring discussions are explained in greater detail in the habitat monitoring update section below.

Discuss Pulse Flow Implementation Alternatives For WY 2007

Abbreviated No Bypass alternative was one alternative selected that would test the 300 cfs ramp rate in the North Platte River system. Kerkman suggested that little information would be gained from a ramp rate test because the trash (i.e., woody and herbaceous vegetation that would become lodged in diversion structures) accumulation has high variability; therefore, the ramp rates that affect trash accumulation would vary annually. Additionally the alternative would provide a projected 1,675 cfs at Overton which is similar to peaks from recent hydrocycling. This alternative was not favored by the group for the above reasons.

It was identified at the meeting that the North Platte Release alternative may have additional Associated Costs from what was originally identified by the Service. In the March 2004 meeting, Central allowed for 4,000 AF of re-regulated of flow at Johnson Reservoir in which any Associated Costs would be shouldered by Central. With the formation of the Program, Kerkman identified that Central would likely require reimbursement for incurred Associated Costs resulting from any future pulse flow reregulation and/or EA bypass. Potential Associated Costs from re-regulation have been identified in the Considerations to Pulse Implementation section of the Service's pulse flow planning document.

Kerkman also identified that hydro maintenance will occur in the spring at Central's facilities, which could potentially interfere with the generation of a pulse flow, but they should be able to schedule outages around any planned pulse flow.

Appendix A

Provide Updates To Flow Monitoring Plan

- Anderson presented an overview of the Unsteady Flow Model developed by USBR that modeled the reach from the J-2 Return to Grand Island. He stated that USBR is also developing an unsteady flow model for the reaches above the J-2 Return.
- Soenkson said that the USGS website will store all stream gage data by their basic unit values as opposed to daily averages. USGS also has a number of stage gages and groundwater wells located near the Platte River. CPNRD may have well data that could assist with calculating bank storage.
- The group identified that additional flow gages were located at Odessa, Cottonwood Ranch, and at the Kearney Canal diversion.
- Runge has information for survey markers near the Gothenburg and Lexington that can be used to calculate the elevation of adjacent bridges. Vertical measurements from the bridge marker can be used to estimate river stage throughout the pulse flow event. Soenkson identified a second option in using pressure transducers to record the maximum stage from a pulse event. Installation of pressure transducers can be accomplished quickly if advance notice was provided.

In summary, the group thought that existing stream gages would provide adequate tracking of a pulse flow. The unsteady flow model could be tested using flow from existing stream gages. Additional information could be gained using bridge measurements/pressure transducers.

Provide Habitat Updates To Habitat Monitoring Plan

- Kinzel is monitoring river morphology at the Cottonwood Ranch and Uridil sites.
- Jenninges said that Carter Johnson has not re-measured vegetation plots since 2002(?)
- Runge stated that aerial photography for the planned 2004 pulse flow event was opportunistic based on planned GC photography. The GC does not plan to acquire photography, and it is questionable if the Program will be able to acquire photography. Jenninges identified that NPPD would likely be acquiring photography in the spring of 2007 for their project areas, and airplane mobilization costs could be shared between the Program and NPPD.
- Vegetation monitoring at the Cottonwood Ranch and Uridil sites will be conducted by USGS-Lincoln.

In summary, the group had various opinions on what minimum monitoring needs were necessary to monitor a 2007 pulse event. Because of the limited time to discuss this topic in greater detail, discussions were tabled for subsequent discussions.

Appendix A

In summary, the group agreed that pre-pulse planning efforts should be continued if a pulse were to be implemented in 2007. These efforts should include: 1) including a pulse release alternative that does not re-regulate EA water, 2) developing an outreach plan to avoid Good Neighbor impacts, 3) identify applicable Associated Costs and their offsets, 4) identify habitat monitoring objectives for a 2007 release, and 5) develop a habitat monitoring plan for any non-pulse peak flow.

Meeting Participants	**Organization**
Don Anderson	USFWS
Mike Fritz	NGPC
Tom Hayden	DNR
Larry Hutchinson	NGPC
Jim Jenninges	NPPD
Jeremie Kerkman	CNPPID
Paul Kinzel	USGS
Frank Kwapnioski	NPPD
Douglas Mollet	NPPD
Mark Peyton	CNPPID
Jeff Runge	USFWS
Phil Soenkson	USGS
David Webster	NPPD
Sharon Whitmore	USFWS

Appendix B

News Release from
The Central Nebraska Public Power and Irrigation District

Date: July 26, 2006
Contact: Tim Anderson, Public Relations Manager
Phone: (308) 995-8601

Quick response minimizes consequences of canal break

(HOLDREGE, Neb.) -- Central District Supply Canal Patrolman Rick Ostergard started his rounds at 7 a.m., on July 19 with a routine inspection at the Diversion Dam and the headgates of the Supply Canal east of North Platte. Satisfied that all was normal, he started down the access road on the east side of the Supply Canal.

At 7:30 a.m., Ostergard noticed water in a field adjacent to the canal. Immediately suspecting a problem, he called Supply Canal Superintendent Doug Viter at Central's office in Gothenburg.

Randy Walker, the control operator on duty in the Control Center monitoring and controlling Central's canal and hydroplant operations, had noticed anomalies in data reported from gauges equipped with remote terminal units (RTU) along the canal. However, nothing suggested a significant problem or could not be explained by ongoing canal operations. The report of water in a field along the Supply Canal coupled with the unusual RTU readings indicated the possibility of a canal break.

Central personnel evaluate the canal break

Viter immediately ordered the headgates of the Supply Canal closed and dispatched dump trucks and a loader from Gothenburg to North Platte.

In the meantime, Ostergard had discovered the source of the water: a 20-foot-wide

Appendix B

break in the Supply Canal's bank located about 1.5 miles downstream from the Diversion Dam. At the time, flows in the canal measured about 1,800 cubic feet per second, about 70 percent of its capacity. Water was spilling through the breach in the bank into an alfalfa field and then flowing into a sandpit lake located near the river. Unable to hold the inflows, the small sandpit spilled the overflow into a nearby drainage ditch that drains to the Platte River.

With the Supply Canal headgates closed, it became necessary for Central to pass flows that were coming down the North and South Platte Rivers through the Diversion Dam. Central opened two river gates to allow 1,800 cubic feet per second to flow down the Platte River.

Gothenburg Division Manager Kevin Boyd notified the National Weather Service at Hastings of the situation, telling them to expect a rise in the river's stage. Boyd also alerted the Nebraska Department of Roads, which had crews working at a construction site near the Platte River at Brady. At the time, it was not known how long bank repairs might take, but quick repairs to the canal minimized the amount of time water was passing the Diversion Dam. The effect on the river's stage proved to be slight and brief, causing no problems downstream.

Repair work in progress

Upon arrival at the site, Central crews immediately began stockpiling dirt from the immediate area for use during bank repairs. Dump trucks and a loader were also sent to a stockpile four miles down the canal to collect dirt that was better suited to compaction than the soil available at the site. Viter also sent for the Gothenburg office's hydraulic excavator that was located at another job site at Plum Creek Reservoir south of Lexington. The excavator was necessary to properly place and compact the earth fill, rather than just attempting to dump loads of dirt into the breach.

The excavator arrived at 10 a.m. and was quickly put into service placing the first of about 400 cubic yards of dirt in the breach. By noon, excavator operator Doug Max had closed the breach and compacted the fill. Max then began placing 50 cubic yards of concrete riprap to protect the repaired canal bank. By 1:00 p.m., the break had been sufficiently reinforced to allow Central to close the Diversion Dam's river gates and re-open the headgates of the Supply Canal to allow water to begin refilling the affected section of canal.

While the breach was being repaired, Viter directed Heavy Equipment Operator Lonnie Warner to begin cutting steel sheet piling into sections for use at the repair site. Forty-five linear feet of sheet piling were transported to the site and driven into the repaired section by 2 p.m. By that time, normal canal diversions and water conveyance had resumed.

Central officials suspect that the canal bank began to give way some time around 5 a.m.

Appendix B

Whether the break occurred gradually or suddenly is not known, but the suspected cause of the break is burrowing by muskrats or other animals, creating a condition referred to as “piping.” The burrows create cavities in the bank that can expand and weaken the earthen banks. Under the right circumstances, the piping can lead to bank failure.

Boyd said there have been no breaks in the Supply Canal’s bank of similar proportion since 1964 or ‘65. He estimated that 150 to 160 acre-feet of water passed through the breach before it could be closed. The water caused little or no damage to adjacent fields, no interruption to irrigation deliveries and only a slight and short-lived decline in water levels at downstream lakes along the Supply Canal.

In the aftermath of the canal break, Boyd praised the quick and efficient response to the situation by Central’s employees. He said Ostergard’s quick reaction to the discovery of water in an adjacent field and Viter’s rapid and effective actions in mobilizing manpower and equipment were critical to minimizing the impact of the canal break. He also complimented Max’ skillful operation of the hydraulic excavator and the men who operated the trucks and loaders for the proficient manner in which repairs were made.

Repair work near completion

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The Central Nebraska Public Power and Irrigation District
415 Lincoln Street , P.O. Box 740
Holdrege, Nebraska 68949
Phone 308-995-8601
For additional information, contact: WebMaster

(Updated 10/3/06)

Appendix C

Jeff Runge/R6/FWS/DOI	To	Sharon Whitmore/R6/FWS/DOI@FWS
11/08/2006 11:09 AM	cc	
	bcc	
	Subject	Fw: maintenance question

Sharon,

I discussed the below subject with Kevin Boyd this morning. Landowners request that reservoir elevations (e.g., Johnson and Jeffrey) are lowered every other year for maintenance of bank stabilization/lake access structures on leased properties. With this drawdown, Central is still able to pass EA water through their system. However, EA conveyance problems could occur when there is an outage for maintenance of a hydro facility. Outages occur annually and are generally one week in duration. Because of the outage, canal capacities are reduced.

Reservoir drawdown and hydro outages occur in October. The likelihood of a peak flow from rainfall is low, and irrigation deliveries have ceased; therefore, it is unlikely that there would be a peak flow event of any significant magnitude that the Service could use as a base for an EA pulse release. Given the above information, any planned outages/maintenance activities should not significantly affect our ability to implement a pulse release.

I had also inquired about emergency repairs that would shut down the canal system. Kevin stated that the summer of this year was the first time for canal failure since 1964 or 1965. The current canal failure was not a result of operating the diversion outside of its normal operating conditions. Kevin did state that a rapid drawdown in the canal system below Johnson Reservoir could result in bank sloughing but not canal failure. When considering our proposal for re-regulation (i.e., two day release of 1,800 cfs from Johnson Reservoir), Kevin stated that the only difference from normal operating conditions is the timing of the release. Therefore, it is reasonable to conclude that the probability for bank collapse/canal failure would not increase as a result of the proposed re-regulation out of Johnson reservoir.

Jeff Runge

----- Forwarded by Jeff Runge/R6/FWS/DOI on 11/08/2006 10:56 AM -----

Jeff Runge	To:	kmboyd@cnppid.com
10/24/2006 11:12 AM	cc:	
	Subject:	maintenance question

Kevin,

It was good meeting you on September 26. I was checking on the North Platte River's inflows on your website and came across a new article about inspections and maintenance at Jeffrey.

Were there a lot of maintenance and bank repairs that needed to be done? The reason for my asking is in regards to pulse flow implementation. As suggested by Frank Kwapnioski, we are considering the possibility of trying to release EA water upon late summer/fall rainstorm events to generate peak flow events of relatively higher magnitude. I was just trying to get a general feel as to what types of maintenance is normally needed for bank repairs and system maintenance. It would also be good to know when these maintenance activities usually occur, and how long these activities generally take.

If there are frequent times when reservoirs will be down for maintenance, then we will try to avoid these times when considering a pulse release. There is no need to go into great detail because we are very early into this scoping process.

Appendix C

Thanks for your help.

Jeff

Appendix D

Subject: RE: Revised Bypass documents
To: "Clayton Derby" <cderby@west-inc.com>,
<mpurcell@wyoming.com>,
<donald_anderson@fws.gov>,
"Kraus,, Don- Central Nebr. Pub. Pow. & Irr. Dist." <dkraus@cnppid.com>,
Cc: <dstrickland@west-inc.com>,
"Jim Cook" <jcook@dnr.state.ne.us>,
"Roger Patterson" <rpatterson@dnr.state.ne.us>,
"Mark Butler" <MBUTLER@prs.usbr.gov>

Clayton et al.

Clayton, I did not see a Nebraska Rep. for the by-pass group so I have copied Jim and Roger.

Based on the goal to have responses/comments in by June 17, I have made a couple of recommended revisions see attached documents) , have a question and will provide some information I have been able to put together regarding NPPD's potential costs related to EA by-pass.

My question relates to the role of the EA AOP and the Program AOP. We use the Program AOP in the write-up for the program attachment but I wonder if it would be more appropriate to use EA AOP per the Environmental "Account Document. Will the Program AOP included the EA AOP? I read the program water section documents and could not tell what was intended.

In attempting to identity what NPPD's costs may be (note inflation and radical changes in the market price of power are not considered) I started with Don Anderson's spreadsheet which shows in Attachment A an EA by pass of approximately 12,000 AF. Central has indicated that this would result in lost generation from their hydro's of 4,000mwh's. I then asked our marketing people what the costs have been in March and May (Months identified in Don Anderson's paper) of 2004 and 2005 to estimate the cost of replacement power. The costs of power vary based on peak, non-peak and block type purchases so the costs for each are provided. As NPPD uses the hydros to follow peaks as much as possible it is a representative cost of the replacement power. Another option is to pre-by power in a block of 7 X 24 and that may be an option if the amount of replacement power can be identified so I believe the range of the 7 X 24 and peak prices represent a reasonable range (based on similar market prices) of impacts to NPPD from the by-pass of EA water, based on the 2006 plan. NPPD's cost of purchased power in March and May of 2004 and 2005 are provided below:

March - 04 May - 04

Appendix D

	March - 05	May - 05		
Peak	$43.46	$52.81	$40.12	$46.80
Non-peak	$17.34	$21.30	$26.31	$26.71
7 X 24	$37.28	$40.08	$33.37	$38.16

The 2005 cost paid to Central under the contract is approximately $32.00

So for 4,000 mwh lost and purchased at peak price of say $50/mwh - $200,000 - 128,000(contracted price) = $72,000 per event and at the block rate of $40/mwh = $160,000 - $128,000 - $32,000.

So an estimate of costs to NPPD would be from $32,000 - $72,000 per event. If there are 13 events in the first increment then the range of impacts is $416,000 - $936,000. (As noted before this does not reflect inflation or changes in the cost of market power.) In addition, this does not include any dollars for the USFWS requesting EA by-pass at the Keystone Diversion and the resultant loss of generation at the North Platte Hydro.

On a last item the Districts were to identify what "other costs" might be incurred. While we would like some additional time to think about what other costs may be incurred,I have seen two such costs that were identified in the settlements and they relate to damage to sand dams associated with river irrigation diversions and to tern and plover nesting islands included in NPPD's FERC license. In addition, there may be some transaction costs associated with the purchase of offsetting power.

If there are questions before the by-pass workgroup gets together, please let me know.

Brian

NPPD Water Resources Manager
402-563-5335 / 5095 Fax

Appendix E. Site visits at diversion structures in the North Platte and Platte River systems.

Site Visit at Diversions along the North Platte River System
September 26, 2006

Attendees: Jeff Runge (USFWS), Sharon Whitmore (USFWS), Tom Hayden (NDNR), Shane Wright (NDNR); Diversions listed from upstream to downstream.

Keith-Lincoln Canal (Figures 1)
- Representative Doug Marquette
- Priority date 2-2-1894 (81 cfs)
- No debris concerns because diversion is first in line and receives the highest flow (@ 1,400 cfs last year)

North Platte Canal (Figures 2)
- Representative Martin Fisher
- Priority date 5-13-1884 (201 cfs)
- There is also a concern for debris build-up especially if flows are to exceed recent high flows (i.e., approximately 1,400 cfs minus Keith-Lincoln canal diversion)

Paxton-Hershey Canal (Figures 3 and 4)
- Representative Earnest Schuster
- Priority date 2-12-1894 (103 cfs)
- Since Suburban Canal receives much of their water from Birdwood Creek, very little flow passes the Paxton-Hershey Canal diversion for much of the irrigation season
- There is concern for debris build-up especially if flows are to exceed recent high flows (i.e., approximately 1,400 cfs minus Keith-Lincoln and North Platte canal diversions)

Suburban Canal (Figures 5 and 6)
- Representative Martin Fisher for Lloyd Bauer
- Priority date 5-22-1894 (78 cfs)
- Canal has 2 diversions located on 2 separate channels
- Can shift flows from one diversion to other if trash build-up is observed
- Receives consistent base flows from Birdwood Creek (a consistent, spring-fed tributary to the North Platte River)

Tri-County Diversion Dam (NPPD)
- Representative Kevin Boyd
- 5 low flow gates (Figure 7 and 8) can pass 1,500 cfs
- opening remaining 8 gates (all gates open, Figure 8) would allow 26,000 cfs to pass which diminishes likelihood of trash accumulation

- flow at supply canal updated real-time
- Under FERC requirements, 1,200 cfs was released downstream from the diversion for 20 minutes in 2005. No scouring of phragmites was evident in areas immediately downstream of the release site.
- Boyd also operates Johnson Reservoir
    - System should be able to manage 4,000 af of re-regulation over 3 days
    - Re-regulation of this magnitude was present in wet years

Site Visit at Diversions along the Platte River System (Brady to Lexington Reach) October 5, 2006

Attendees: Jeff Runge (USFWS), Sharon Whitmore (USFWS), Tom Hayden (NDNR), Jim Ostdiek (NDNR), Dave Webster (NPPD), John Shadle (NPPD)

30-mile Canal (Figure 9)

- Representative Jim Harris
- Priority dates 10-22-1894 to 12-13-1927 (total 303 cfs)
- Solidly built mainstem diversion that receives water primarily from the Jeffrey Hydro return
- Water that bypasses the diversion flows through the north channel past the Gothenburg Canal diversion
- Water is allowed to flow through phragmites-choked south channel after the irrigation season (Figure 10)
- One sand dam located between the 30-mile and Gothenburg Canal blocks an overflow channel (Figure 11)
    - Sand dam was last breached in by high flows in approximately 1997 (approximately 15,000 cfs)

Gothenburg Canal (NPPD) (Figure 12)

- Representatives Dave Webster and John Shadle
- Priority dates 7-5-1890 to 7-23-1990 (total 272 cfs)
- Solidly built mainstem diversion that receives water from the 30-mile canal bypass and the Platte River (nearest gage at Brady) (Figure 13)
- Water that bypasses the diversion flows through the north channel past the Gothenburg Canal diversion
- Bypassed water provides flows to remaining canals along the Platte

Platte River Sand Dam (Figure 14)

- Flows from the Gothenburg Canal bypass has a tendency to migrate from the north channel to the south channel
- Sand dam was created to divert the majority of flows to the north channel
- Two 24” culverts in sand dam allows for a minimum flow to reach diversions along the south channel (Figure 15)
- Sand dam was breached in mid-1990s has not been breached since

- Phragmites encroaching in channel above the dam creating possible water supply problems to south channel diversions
- Decreasing availability of sand in channel increases difficulty in rebuilding sand dams

Cozad Canal

- Representative Les Wolf (Figure 16)
- Priority dates 12-28-1894 to 7-23-1990 (total 235 cfs)
- Located on northern channel below Platte River Sand Dam
- Two additional sand dams needed to force water to diversion
    - One dam built with rock and trees prevents water from flowing onto a KOA campground located on south side of I-80 interchange
        - Sand dam was not washed out for duration of Les's appointment as canal manager (2001 to present)
        - Les has no knowledge of prior breaches
    - A second sand dam is needed to keep water from flowing around the diversion through a side channel
        - Sand dam was breached in 2004 (peak flows of 1,226 cfs at Brady/Jeffrey and 253 cfs at Cozad)
- Solidly built diversion with stabilized streambanks
- Bypassed water provides flows to Dawson Canal

Dawson Canal (NPPD) (Figure 17)

- Representatives Dave Webster and John Shadle
- Priority dates 6-14-1984 to 6-28-1979 (total 449 cfs)
- Located on northern channel below Cozad Canal Diversion
- Solidly built mainstem diversion with stabilized streambanks (Figure 18)

6-mile Canal

- Representative Larry Gill
- Priority dates 10-22-1894 (total 23 cfs)
- Located on southern channel below Platte River Sand Dam
- One sand dam is needed to force water to diversion
    - Sand dam last breached in 1997-1998 (approximately 15,000 cfs) (Figure 19)
- Bypassed water provides flows to Orchard-Alfalfa Canal

Orchard-Alfalfa Canal (Figures 20 and 21)

- Representative – Curtis Sargent (Operator)
- Also known as South Side Irrigation District and Jerk Water Irrigation District
- Receives water through Gothenburg Canal bypass
- Located on southern channel with 2 sand dams needed to force water to diversion
    - The first sand dam was breached in 1997-1998 (approximately 15,000 cfs)
    - Decreasing availability of sand in channel increases difficulty in rebuilding dams

- Diversion has been susceptible to damage due to prior high flow events
  - Channel degradation has resulted in scour below the diversion's apron

Kearney Canal (NPPD) (Figures 22 and 23)

- Representatives Dave Webster and John Shadle
- Priority dates 9-10-1882 to 8-24-1987 (total 405 cfs)
- Solidly built mainstem diversion receives water primarily from the J-2 return
  - Also receives water from Platte River generally after the irrigation season (Nearest gage at Overton)
- Diverting approximately 280 cfs (as of October 5, 2006)
- Annual diversions usually occur up to November

Appendix E

Figure 1. Diversion for Keith-Lincoln Canal.

Figure 2. Diversion for Platte Valley Canal.

Appendix E

Figure 3. Diversion for Paxton-Hershey Canal (South End).

Figure 4. Diversion for Paxton-Hershey Canal (North End).

Appendix E

Figure 5. Diversion for Suburban Canal.

Figure 6. Gates for Suburban Canal.

Appendix E

Figure 7. Tri-County Diversion Dam (Low Flow Area – North Side).

Figure 8. Tri-County Diversion Dam (Full View).

Figure 9. Main channel diversion for the 30-mile Canal.

Figure 10. South channel of Platte River downstream of the 30-mile Canal diversion.

Figure 11. Sand dam blocking overflow channel between 30-mile Canal and Gothenburg Canal diversions.

Figure 12. Main channel diversion for the Gothenburg Canal.

Figure 13. Platte River upstream of Gothenburg Canal diversion (Brady Bridge in view).

Figure 14. Platte River Sand Dam.

Appendix E

Figure 15. Culverts in the Platte River Sand Dam.

Figure 16. Main channel diversion for the Cozad Canal.

Appendix E

Figure 17. Main channel diversion for the Dawson Canal.

Figure 18. Regulating dam for the Dawson Canal.

Figure 19. Sand dam for the 6-mile Canal.

Figure 20. Main channel diversion for the Orchard-Alfalfa Canal.

Figure 21. Gates for the Orchard-Alfalfa Canal.

Figure 22. Kearney Canal diversion dam

Figure 23. Kearney Canal diversion dam

----- Forwarded by Sharon Whitmore/R6/FWS/DOI on 01/12/2004 10:40 AM -----

"Jenniges, James J." <jjjenni@nppd.com>	To:	"Paul Kinzel" <pjkinzel@usgs.gov>
	cc:	"clayton derby" <cderby@west-inc.com>, "Felipe" <fchavez@whoopingcrane.org>, "John Shadle" <jjshadl@nppd.com>, "Kenny Dinan" <kenny_dinan@fws.gov>, "Kirk Schroeder" <kirk_d_schroeder@fws.gov>, "Mark Peyton" <mpeyton@cnppid.com>, "Mike Fritz" <mfritz@ngpc.state.ne.us>, "Rocky Plettner" <RGPLETT@NPPD.COM>, "Sharon Whitmore" <sharon_whitmore@fws.gov>
01/12/2004 09:02 AM	Subject: water level	

Paul since there seems to be some interest in trying to get water over the top of some of the islands we cleared last year and the FWS is talking to you about it instead of me, I thought you would be interested in these pictures. First picture is our west tern and plover island that shows the water has backed up clear to the fence. Second picture shows one of the islands we cleared with only the top foot or so showing. I would guess this water surface elevation would be similar to what it would be with 3,500-5,000 cfs.

<<westtptest.jpg>> <<Bartext.jpg>>

Of course the amount of scour you get is dependent on how the ice forms where the water finds a way through and how the ice comes off. Below is a picture showing where the entire channel must of froze and the water started flowing over the ice. I have seen this in the past also and it makes some interesting bars (much higher than you can get otherwise). I have heard some people hypothesize it is these kind of ice processes that make most of the islands used by terns and plovers in the lower Platte and on the Loup. Usually what happens on the central Platte is the water just starts flowing through the wooded flood plain. This ice event however did not get quite that high so the water stayed with in the channel. Also included is a picture of the ice around the staff gauge so that you get an idea of the relative height.

<<Bartext.jpg>> <<staff.jpg>>

If you have any questions feel free to call.

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Appendix F